Unit 1.3   **Solving Equations Variable on both Sides**

Solve each equation.

1. $5x + 2 = 3x - 6$

$5x + 2 = 3x - 6$	Write the original problem
$5x - (3x) + 2 = 3x - (3x) - 6$	Subtract 3x from both side
$2x + 2 = -6$	Simplify and Combine like terms
$2x + 2 - (2) = -6 - (2)$	Subtract 2 from both side
$2x = -8$	Simplify
$\frac{2x}{2} = \frac{-8}{2}$	Divide by 2 to both side
$x = -4$	Simplify

3. $2x + 4 - x = 4x - 5$

$2x + 4 - x = 4x - 5$	Write the original problem
$x + 4 = 4x - 5$	Combine like terms
$x - x + 4 = 4x - x - 5$	Subtract x from both side
$4 = 3x - 5$	Simplify and Combine like terms
$4 + (5) = 3x - 5 + (5)$	Add 5 to both side
$9 = 3x$	Simplify
$\frac{9}{3} = \frac{3x}{3}$	Divide by 3 to both side
$3 = x$	Simplify

5. $2(3 - 2x) = x - 4$

$2(3 - 2x) = x - 4$	Write the original problem
$2 \cdot (3) + 2 \cdot (-2x) = x - 4$	Distribute
$6 - 4x = x - 4$	Simplify
$6 - 4x + 4x = x + 4x - 4$	Add 4x to both side
$6 = 5x - 4$	Simplify and Combine like terms
$6 + (4) = 5x - 4 + (4)$	Add 4 to both side
$10 = 5x$	Simplify
$\frac{10}{5} = \frac{5x}{5}$	Divide by 5 to both side
$2 = x$	Simplify

7. $2(x + 3) = -4(x + 1)$

$2(x + 3) = -4(x + 1)$	Write the original problem
$2 \cdot (x) + 2 \cdot (3) = -4 \cdot (x) - 4 \cdot (1)$	Distribute
$2x + 6 = -4x - 4$	Simplify
$2x + (4x) + 6 = -4x + (4x) - 4$	Add 4x to both side
$6x + 6 = -4$	Simplify and Combine like terms
$6x + 6 - (6) = -4 - (6)$	Subtract 6 from both side
$6x = -10$	Simplify
$\frac{6x}{6} = \frac{-10}{6}$	Divide by 6 to both side
$x = -\frac{5}{3}$	Simplify

9. $-[6x - (4x + 8)] = 9 + (6x + 3)$

$-[6x - (4x + 8)] = 9 + (6x + 3)$	Write the original problem
$-[6x - 1 \cdot (4x) - 1 \cdot (8)] = 9 + 1(6x) + 1(3)$	Distribute
$-[6x - 4x - 8] = 9 + 6x + 3$	Simplify
$-[2x - 8] = 12 + 6x$	Combine like terms
$-1 \cdot (2x) - 1 \cdot (-8) = 12 + 6x$	Distribute
$-2x + 8 = 12 + 6x$	Simplify
$-2x + (2x) + 8 = 12 + 6x + (2x)$	Add 2x to both side
$8 = 12 + 8x$	Simplify and Combine like terms
$8 - (12) = 12 - (12) + 8x$	Subtract 12 from both side
$-4 = 8x$	Simplify
$\frac{-4}{8} = \frac{8x}{8}$	Divide by 8 to both side
$-\frac{1}{2} = x$	Simplify

11. $7[2 - (3 + 4x)] - 2x = -9 + 2(1 - 15x)$

$7[2 - (3 + 4x)] - 2x = -9 + 2(1 - 15x)$	Write the original problem
$7[2 - 1 \cdot (3) - 1 \cdot (4x)] - 2x = -9 + 2 \cdot (1) + 2 \cdot (-15x)$	Distribute
$7[2 - 3 - 4x] - 2x = -9 + 2 - 30x$	Simplify
$7[-1 - 4x] - 2x = -7 - 30x$	Combine like terms
$7 \cdot (-1) + 7 \cdot (-4x) - 2x = -7 - 30x$	Distribute
$-7 - 28x - 2x = -7 - 30x$	Simplify
$-7 - 30x = -7 - 30x$	Combine like terms
$-7 - 30x + (30x) = -7 - 30x + (30x)$	Add 30x to both side
$-7 = -7$	Simplify and Combine like terms

No variables left means: if statement is FALSE then "No Solution"
If statement is TRUE then "All Real Solutions"

-7 does equal -7, so TRUE
Therefore,
All Real Solutions

13. $\frac{2x-3}{7} + \frac{3}{7} = -\frac{x}{3}$

$\frac{2x-3}{7} + \frac{3}{7} = -\frac{x}{3}$ Write the original problem

$21 \cdot \left(\frac{2x-3}{7} + \frac{3}{7}\right) = \left(\frac{-x}{3}\right) \cdot 21$ Multiply both sides both Least Common Denominator (LCD), 21

$21 \cdot \left(\frac{2x-3}{7}\right) + 21\left(\frac{3}{7}\right) = \left(\frac{-x}{3}\right) \cdot 21$ Distribute

$3 \cdot (2x - 3) + 3 \cdot (3) = (-x) \cdot 7$ Simplify

$3 \cdot (2x) + 3 \cdot (-3) + 3 \cdot (3) = (-x) \cdot 7$ Distribute

$6x - 9 + 9 = -7x$ Simplify

$6x = -7x$ Combine like terms

$6x + 7x = -7x + (7x)$ Add 7x to both side

$13x = 0$ Simplify

$\frac{13x}{13} = \frac{0}{13}$ Divide by 13 to both side

$x = 0$ Simplify

15. $0.02(50) + 0.08x = 0.04(50 + x)$

$0.02(50) + 0.08x = 0.04(50 + x)$ Write the original problem

$100 \cdot (0.02(50) + 0.08x) = (0.04(50 + x)) \cdot 100$ Multiply both sides by 100

$100 \cdot (0.02(50) + 100 \cdot (0.08x) = 100 \cdot 0.04(50 + x)$ Distribute

$2(50) + 8x = 4(50 + x)$ Simplify

$100 + 8x = 4 \cdot (50) + 4 \cdot (x)$ Distribute

$100 + 8x = 200 + 4x$ Simplify

$100 + 8x - (4x) = 200 + 4x - (4x)$ Subtract 4x from both side

$100 + 4x = 200$ Simplify and Combine like terms

$100 - (100) + 4x = 200 - (100)$ Subtract 100 from both side

$4x = 100$ Simplify

$\frac{4x}{4} = \frac{100}{4}$ Divide by 4 to both side

$x = 25$ Simplify

17. $0.006(x + 2) = 0.007x + 0.009$

$0.006(x + 2) = 0.007x + 0.009$	Write the original problem
$1000 \cdot 0.006(x + 2) = (0.007x + 0.009) \cdot 1000$	Multiply both sides by 1000
$6(x + 2) = 1000 \cdot (0.007x) + 10000 \cdot (0.009)$	Distribute
$6(x + 2) = 7x + 9$	Simplify
$6 \cdot (x) + 6 \cdot (2) = 7x + 9$	Distribute
$6x + 12 = 7x + 9$	Simplify
$6x - (6x) + 12 = 7x - (6x) + 9$	Subtract 6x from both side
$12 = x + 9$	Simplify and Combine like terms
$12 - (9) = x + 9 - (9)$	Subtract 9 from both side
$3 = x$	Simplify